



FEB 25 10 21 AM '99

February 23, 1999

Mr. Chuck Schwer  
Vermont ANR/DEC  
Waste Management Division  
103 South Main St. /West Building  
Waterbury, VT 05671-0404

RE: Initial Investigation of Suspected Subsurface Petroleum Contamination  
Champlain Valley Sunoco, South Burlington, Vermont (VTDEC Site #98-2491)

Dear Mr. Schwer:

Enclosed please find the summary report for the site investigation conducted at the above referenced site.

Please contact me if you have any questions or comments.

Sincerely,

Christine Ward  
Hydrogeologist

Enclosure

c.: Ms. Sharon Abbott (w/o enclosure)  
GI#119841411

**INITIAL INVESTIGATION OF  
SUSPECTED SUBSURFACE PETROLEUM  
CONTAMINATION**

**CHAMPLAIN VALLEY SUNOCO  
1143 WILLISTON ROAD  
SOUTH BURLINGTON, VERMONT**

(VTDEC SITE #98-2491)  
GI #119841411

February 1999

*Prepared for*

W.A. Sandri, Inc.  
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*Prepared by*



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FEB 25 10 21 AM '99

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## **I. INTRODUCTION**

This report summarizes the initial investigation of suspected subsurface petroleum contamination at the Champlain Valley Sunoco (the Site) at 1143 Williston Road in South Burlington, Vermont (see Site Location Map, Appendix A). This work was requested by Mr. Chuck Schwer of the Vermont Department of Environmental Conservation (VTDEC) in a letter to Mr. Edward Bitzer of Sandri, Inc. dated October 28, 1998. This work was performed in accordance with the November 8, 1998, *Work Plan and Cost Estimate for a Subsurface Investigation of Suspected Petroleum Contamination* prepared by Griffin. The work plan was approved by Mr. Bob Butler (VTDEC) in a letter to Mr. Bitzer dated November 30, 1998.

Subsequent to the UST closure activities, the VTDEC requested that the soils be removed from the site due to the potential risk to neighboring residential. A work plan for the stockpiled petroleum contaminated soils was prepared and submitted to the VTDEC on December 10, 1998. This work plan was approved by Mr. Butler (VTDEC) in a letter to Mr. Richard Barnes (Sandri) dated December 15, 1998.

## **II. SITE BACKGROUND**

### **A. Site History**

On September 21, 1998, petroleum contamination was detected at the Site during soil field screening at the routine removal of three 6,280-gallon capacity gasoline underground storage tanks (USTs). Soil samples collected during the UST closure were screened for volatile organic compounds (VOCs) using PhotoVac MicroTip model #MP-1000 portable photoionization detector (PID) equipped with a 10.6 eV lamp. Soils collected from the excavation of the USTs had VOC readings up to 1034 parts per million (ppm) [2]. Groundwater was encountered in the excavation at a depth of 14 feet below grade. Free product, approximately 1/8 inch thick, was detected on the groundwater in the tank bed.

An estimated 300 cubic yards of petroleum-impacted soils were generated at the Site during the permanent closure and replacement of the three 6,280-gallon gasoline USTs. The soils were generated to make room for installation of three replacement USTs of greater capacity (i.e., 8000 gallons each), and the soils were unsuitable for use as backfill material required under Vermont UST regulations. The soils were stockpiled on the southern side of the Sunoco property.

As a result of the petroleum contamination detected in the subsurface beneath the former USTs, the VTDEC requested that additional work be conducted at the Site in order to determine the extent and degree of petroleum contamination.

## **B. Site Description**

The Champlain Valley Sunoco is located on the south side of Williston Road (Route 2), in a commercial area of South Burlington, Vermont. The Sunoco station is a one story building with a slab on grade foundation. The office is located on the east side of the building. A car wash is located in the bay on the west side of the building. In the center of the building is an auto repair bay. The ground surface topography of the site is fairly level. There is a ravine behind the buildings north of the Site.

The Site is bordered to the west by the Ramada Inn. The Site is bordered to the east by Mary Street, on the opposite side of Mary Street is a house that is utilized for commercial purposes including an insurance agency and a massage business. The area south of the Site is primarily residential. Across Williston Road to the north, is Bernie's Auto Sales and Windshield World, and to the northeast is a building containing P.G. Goodies (sandwich shop), Breadsmith (bakery), No. 1 Chinese (restaurant), and The Electric Beach (tanning salon).

The Site and surrounding area are serviced by municipal water and sewer. South Burlington is part of the Champlain Water District, which gets its water from Lake Champlain.

## **C. Site Geology**

According to the Surficial Geologic Map of Vermont [3], the Site is underlain by pebbly marine sand deposited in the Champlain Sea. Bedrock below the Site is mapped as the Danby formation, consisting of interbedded quartzite and dolomite [4].

# **III. INVESTIGATIVE PROCEDURES**

To further define the extent of subsurface petroleum contamination in the area of the former USTs, the following investigative tasks were undertaken: soil borings; monitoring well installations; determination of groundwater flow direction and gradient; groundwater sample collection and analyses for petroleum related constituents; and a sensitive receptor survey.

## **A. Monitoring Well Installation**

Four shallow monitoring wells, MW-1 through MW-4, were installed on January 12, 1999, by T&K Drilling, Inc., under the direct supervision of a Griffin hydrogeologist. The soil borings for the monitoring wells were advanced with a truck mounted 4¼" hollow stem auger. The monitoring well locations are indicated on the Site Map (Appendix A).

During borehole advancement, a two-foot split spoon sampler was advanced ahead of the augers every five feet. Undisturbed soil samples, collected from the borings with the split spoon sampler, were logged by the supervising hydrogeologist and screened for the presence of VOCs using an HNu™ systems Model HW-101 PID equipped with a 10.2 eV lamp. Prior to screening, the PID was calibrated with isobutylene referenced to benzene. Soils were screened using the Griffin Jar/Polyethylene Bag Headspace Screening Protocol, which conforms to state and industry standards. Soil characteristics and contaminant concentrations were recorded by the hydrogeologist in detailed well logs which are presented in Appendix B.

Monitoring well MW-1 was installed south of the former and current UST pit, in a presumed upgradient direction from the source area. Monitoring well MW-2 was installed east of the USTs, in a presumed crossgradient direction from the source area. Monitoring well MW-3 was installed north of the USTs and east of the fuel dispenser island, in a presumed downgradient direction from the source area. Monitoring well MW-4 was installed northwest of the USTs and west of the fuel dispenser island, in a presumed downgradient to crossgradient direction from the source area.

Soil encountered in the four borings for the monitoring wells consisted primarily of brown sandy silt from grade to approximately seven feet below grade. This was underlain by silty clay in the boring for MW-1, silt in the boring for MW-2, and by silt underlain by clay in the borings for MW-3 and MW-4. During drilling, the water table was encountered at an approximate depth of 10 feet below grade in each of the four borings.

No VOCs were detected with the PID (i.e. readings were below 1 ppm) from the soils collected from the borings for the four monitoring wells, except for the samples collected near the water table in the borings for MW-2, MW-3, and MW-4. The soil sample collected near the water table in MW-2, from 10 to 12 feet below grade, had a PID reading of 2 ppm; the next sample collected at 15 to 17 feet below grade had a non-detect PID reading of 0 ppm. The soil sample collected near the water table in MW-3, from 10 to 12 feet below grade, had a PID reading of 70 ppm; the next sample collected at 15 to 17 feet below grade had a PID reading of 1 ppm. The soil sample collected near the water table in MW-4, from 10 to 12 feet below grade, had a PID reading of 4 ppm; the next sample collected at 15 to 17 feet below grade had a non-detect PID reading of 0.2 ppm.

Each of the new monitoring wells was constructed in a similar fashion, with two-inch diameter, Schedule 40 PVC well screen and riser. Each well contains a ten-foot length of 0.010-inch, factory-slotted screen, from 5 to 15 feet below grade. A sand pack was installed in the annular space around the well screen from the bottom of the boring to one foot above the top of the screened interval in each borehole. An approximate one-foot thick bentonite surface seal was then installed above the sand pack. Each well was fitted with a gripper cap, and secured with an aluminum, water-tight road box. The road box on each well is flush-mounted, set in concrete, and suitable for vehicular traffic. The new monitoring wells were developed by bailing immediately after installation.

## **B. Groundwater Flow Direction and Gradient**

Water table elevation measurements were collected from the four on-site monitoring wells on January 21, 1999. The top of casing elevations were determined relative to MW-1, which was arbitrarily set at 100 feet. The depth to water in each well was subtracted from the top of casing elevation to obtain the relative water table elevation. Water level data are presented in Appendix C. No free phase product was detected in the wells on January 21, 1999. Water table elevations were plotted on the Site map to generate the Groundwater Contour Map figure presented in Appendix A.

The relative water table elevations measured on January 21, 1999, suggest that groundwater flow at the Site exhibits radially inward flow directed generally toward the northeast at a hydraulic gradient of approximately 1.2%. This flow direction appears to be toward a small ravine on the north side of Williston Road.

Based on this flow direction, monitoring well MW-1 is located in a upgradient direction from the source area. Monitoring well MW-2 is located in a crossgradient to downgradient direction from the source area. Monitoring well MW-3 is located in a downgradient direction from the source area. Monitoring well MW-4 is located in a crossgradient direction from the source area.

## **C. Groundwater Sampling and Analyses**

Griffin collected groundwater samples from the four on-site monitoring on January 21, 1999. The water samples were analyzed by Endyne, Inc. of Williston, Vermont, by EPA Method 8021B for the presence of benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tertiary butyl ether (MTBE), naphthalene, and the alkylbenzenes: 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene.

Results of the laboratory analyses for the monitoring wells are summarized in Appendix D. The laboratory analysis report is contained in Appendix E. Analytical results of the trip blank and duplicate samples indicate that adequate quality assurance and control were maintained during sample collection and analysis.

The groundwater sample collected from upgradient monitoring well MW-1 had no detectable levels of petroleum compounds.

Benzene, toluene, MTBE, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, and naphthalene were detected in the groundwater sample collected from MW-2 in concentrations exceeding the Vermont Groundwater Enforcement Standards (VGES) for these compounds. Concentrations of xylenes and ethylbenzene, below the VGES, were also detected in the sample from MW-2.

The groundwater sample collected from the downgradient monitoring well MW-3 contained concentrations of benzene, toluene, ethylbenzene, xylenes, MTBE, and 1,2,4-trimethylbenzene,

exceeding the VGES for these compounds. A trace concentration of 1,3,5-trimethylbenzene below the sample specific method detection limit of 1,000 ppb was detected in MW-3; this detection limit was greater than the VGES of 4 ppb for this compound and it is possible that 1,3,5-trimethylbenzene was present in the sample at a concentration above the VGES for this compound.

Naphthalene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene were detected in the groundwater sample collected from MW-4 in concentrations exceeding the VGES for these compounds. Concentrations of ethylbenzene and xylenes, below their respective VGES, were also detected in the sample from MW-4.

#### **D. Sensitive Receptor Survey**

A qualitative risk assessment was conducted to identify known and potential receptors of the limited contamination detected at the Site. A visual survey was conducted during the monitoring well installation on January 12, 1999. Based on these observations, a determination of the potential risk to identified receptors was made.

The soil and groundwater in the vicinity of the former USTs are receptors of the contamination detected.

The depth to groundwater in the four on-site monitoring wells measured on January 21, 1999, ranged from approximately 8 to 9 feet below ground surface. Given these groundwater depths it is unlikely that subsurface utility lines along Williston Road serve as potential conduits of the detected petroleum contamination.

The nearest surface water is a small brook, located approximately 500 feet northeast of the Site. The brook flows toward the north-northwest and eventually discharges into the Winooski River. The risk to the small brook is considered minimal given the sufficient distance between the Site and the small brook.

The risk due to vapors is minimal based on the non-detection of VOCs with the PID in the unsaturated soils in the borings for the monitoring wells and given that the Sunoco building is slab on grade construction and the area surrounding the gasoline USTs is paved. There are no known basements in the buildings in the downgradient direction, with respect to the shallow surficial aquifer, from the Site

The Site and surrounding area are serviced by municipal water supplies.



#### **IV. SOIL STOCKPILE DISPOSAL**

Soil samples were collected from the soil stockpile for laboratory analysis on December 10, 1998, in anticipation of disposing the soils by asphalt batching at MTS's facility in Chichester, NH. Results of these analyses are presented in Appendix F.

Since the VTDEC granted approval for landfilling all soils with VOC readings below 100 ppm, the decision was made to take the soils which exhibited VOC readings less than 100 ppm, as measured with a PID, to the Moretown Landfill. Any soils with VOC readings greater than 100 ppm would be taken to MTS's facility.

Approximately 300 cubic yards (451.75 tons) of soil were disposed as cover material at the Moretown Landfill. The soils were taken to the Moretown Landfill on December 28 and 29, 1998. The soils were screened for VOCs during the loading by Ms. Sharon Abbott of Sandri, with a MicroTip PID equipped with a 10.6 eV lamp. No soils exhibited VOC readings over 100 ppm; the maximum PID reading detected from the soils as they were being loaded was 49 ppm. Approximately 20 cubic yards of soil were non-detect for VOCs with the PID and had no visual or olfactory evidence of petroleum contamination; these soils were thin-spread over the location of the former soil stockpile. The former location of the soil stockpile will be landscaped by Sandri in the Spring. The documentation of soil disposal at the Moretown Landfill has been provided to the VTDEC by Sandri.

#### **V. CONCLUSIONS**

Based on the results of this initial site investigation at the Champlain Valley Sunoco, Griffin presents the following conclusions:

- 1) There was a release(s) of petroleum to the subsurface in the vicinity of the three former 6,280-gallon gasoline USTs at the Site. The source of the detected petroleum contamination is likely due to spills, overfills, and leaks due to usage over time. The duration and volume of product released is unknown. The source of the petroleum contamination (i.e., the UST systems) were removed in September of 1998.
- 2) VOC readings of soils collected during the UST closures in September of 1998 indicate that adsorbed petroleum compounds existed in the soils in the immediate vicinity of the former USTs. With the source USTs eliminated and some of the contaminated soils removed, it is expected that residual adsorbed petroleum compound concentrations will decrease over time with the progressive action of natural mitigative processes including biodegradation, volatilization, and diffusion.

- 3) Approximately 300 cubic yards (451.75 tons) of petroleum contaminated soil was stockpiled during the UST replacement in September 1998. The soil was disposed as cover material at the Moretown Landfill on December 28-29, 1998.
- 4) Four groundwater monitoring wells, MW-1 through MW-4, were installed by Griffin at the Site on January 12, 1999. VOCs were not detected by field screening methods in soil samples collected from the borings for the monitoring wells, except for the soil samples collected from the saturated zone (i.e. below the water table) in the crossgradient and downgradient monitoring wells MW-2, MW-3, and MW-4. This suggests that the residual petroleum contamination is primarily present in the dissolved phase. With the source USTs eliminated, it is expected that dissolved petroleum compound concentrations will decrease over time with the progressive action of natural mitigative processes including dilution, dispersion, and biodegradation.
- 5) The depth to groundwater measured on January 21, 1999, in the four site monitoring wells was approximately 8 feet below grade. The shallow groundwater flow beneath the Site on this date exhibited radially inward flow directed generally toward the northeast at a hydraulic gradient of approximately 1.2%.
- 6) Groundwater samples were collected from the four site monitoring wells on January 21, 1999. Concentrations of select petroleum compounds detected in the groundwater samples exceeded their respective VGES. With the USTs replaced and some of the contaminated soil removed, it is expected that dissolved petroleum compound concentrations will decrease over time with the progressive action of natural mitigative processes, including dilution, dispersion, and biodegradation.
- 7) The Site and the surrounding area are served by municipal water supplies.
- 8) Based on the estimated shallow groundwater flow direction and the contaminant concentrations detected in the downgradient monitoring well MW-3, it is possible that there has been some off-site migration of dissolved petroleum compounds. However, given that the Site and surrounding area are serviced by municipal water supplies, there appears to be no significant potential risks to identified sensitive receptors based on currently available data.

## VI. RECOMMENDATIONS

Based on the results of this site investigation, Griffin recommends the following:

1. Since select compounds were detected in the groundwater at concentrations exceeding their respective VGES, a confirmatory round of groundwater elevations and samples should be collected from the four site related monitoring wells in April 1999. The groundwater samples should be analyzed for petroleum compounds by EPA Method 8021B. The frequency of future sampling will be reassessed following the April 1999 sampling event.

## REFERENCES

1. USGS 7.5 Minute Topographic Map, Burlington, VT, dated 1948 and photorevised 1987.
2. W.A. Sandri, Inc., September 1998, *Removal Report, Champlain Valley Sunoco, Facility ID #100, 1143 Williston Road, So. Burlington, Vermont,*, letter report to the Vermont Department of Environmental Conservation, Underground Storage Tank Program.
3. Doll, Charles G., ed., 1970, *Surficial Geologic Map of Vermont*, Vermont Geological Survey.
4. Doll, Charles G., ed., 1961, *Centennial Geologic Map of Vermont*, Vermont Geological Survey.

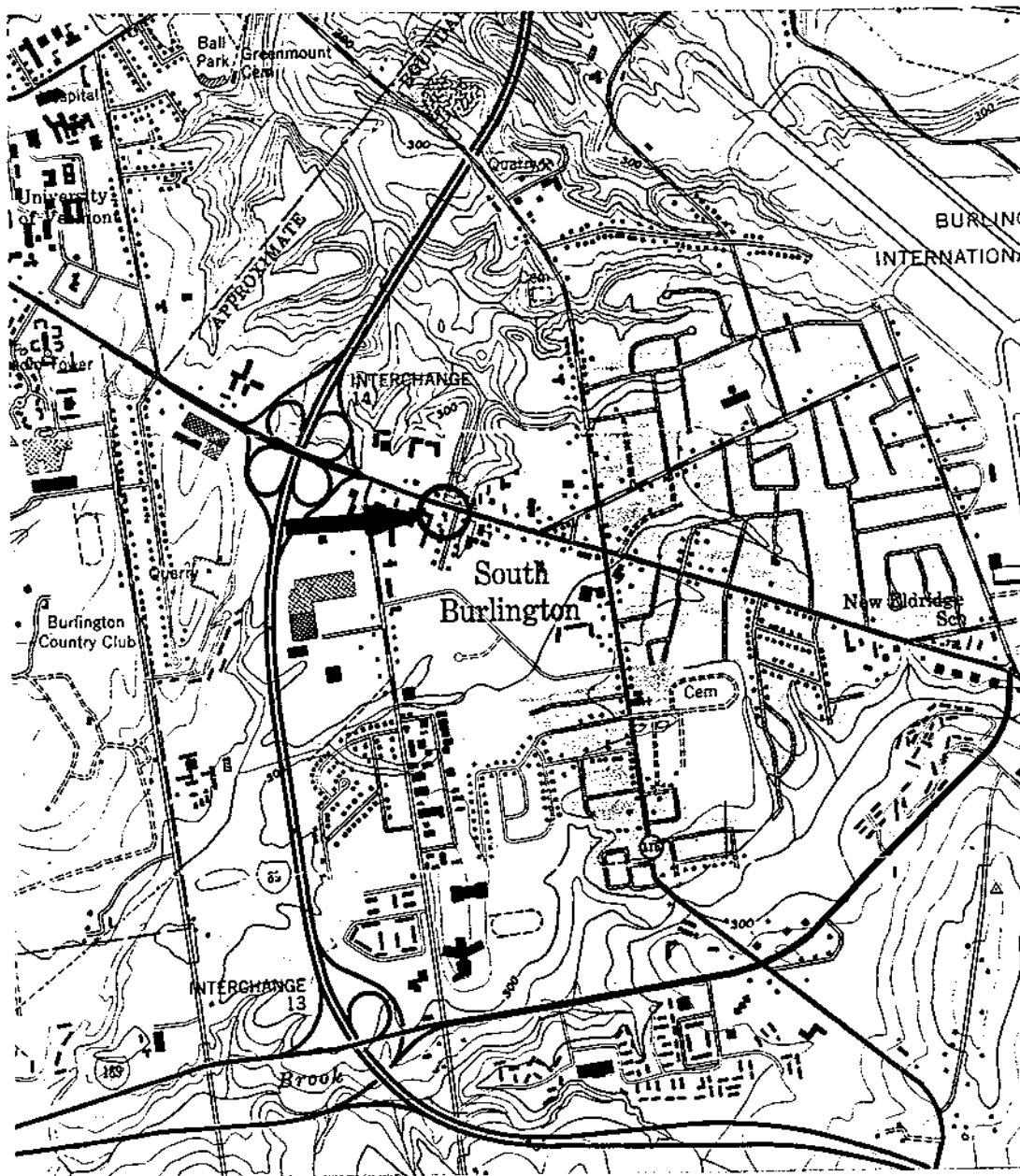
**APPENDIX A**

**Site Location Map**

**Site Map**

**Groundwater Contour Map**

**Contaminant Distribution Map**



SOURCE: USGS- BURLINGTON, VERMONT QUADRANGLE

JOB #:119841411



**CHAMPLAIN VALLEY SUNOCO**

**SOUTH BURLINGTON, VERMONT**

**SITE LOCATION MAP**

DATE: 1/21/99

DWG.#:1

SCALE: 1:24000

DRN.:SB

APP.:CW

MARY STREET

LOCATION OF (3) EXISTING 8,000 GALLON GASOLINE USTs.

PAVEMENT

GRASS ISLAND

GRASS ISLAND

EXISTING SERVICE STATION

MW2

GRASS ISLAND

SIDEWALK

TELEPHONE

SUNOCO SIGN

MW3

PAVEMENT

MW4

GRASS ISLAND

SIDEWALK

SIDEWALK

WILLISTON ROAD



### LEGEND

MW1

MONITORING WELL

---

PROPERTY BOUNDARY

[ ]

PUMP ISLAND

NOTE: SITE MAP PROVIDED BY SANDRI, MONITORING WELLS SURVEYED BY GRIFFIN INTERNATIONAL, INC.



CHAMPLAIN VALLEY SUNOCO

SOUTH BURLINGTON, VERMONT

SITE MAP

DATE: 1/14/88

DWG. #: 2

SCALE: 1"=50'

DRAWN: SMH

APP: CV

MARY STREET

LOCATION OF (3) EXISTING 8,000 GALLON GASOLINE USTs.

SIDEWALK

TELEPHONE

SUNOCO SIGN

APPROX. DIRECTION OF GROUNDWATER FLOW

WILLISTON ROAD

MW1  
91.35'

GRASS ISLAND

PAVEMENT

GRASS ISLAND

EXISTING SERVICE STATION

MW2  
90.78'

GRASS ISLAND

PAVEMENT

MW3  
90.30'

90.8'

90.8'

91.0'

MW4  
91.10'

91.2'

GRASS ISLAND

SIDEWALK



# LEGEND

MW2  
90.78'

MONITORING WELL AND WATER TABLE ELEVATION IN FEET

91.0'

GROUNDWATER CONTOUR IN FEET (DASHED WHERE INFERRED)

---

PROPERTY BOUNDARY



PUMP ISLAND

JOB NO. 119801411



CHAMPLAIN VALLEY SUNOCO

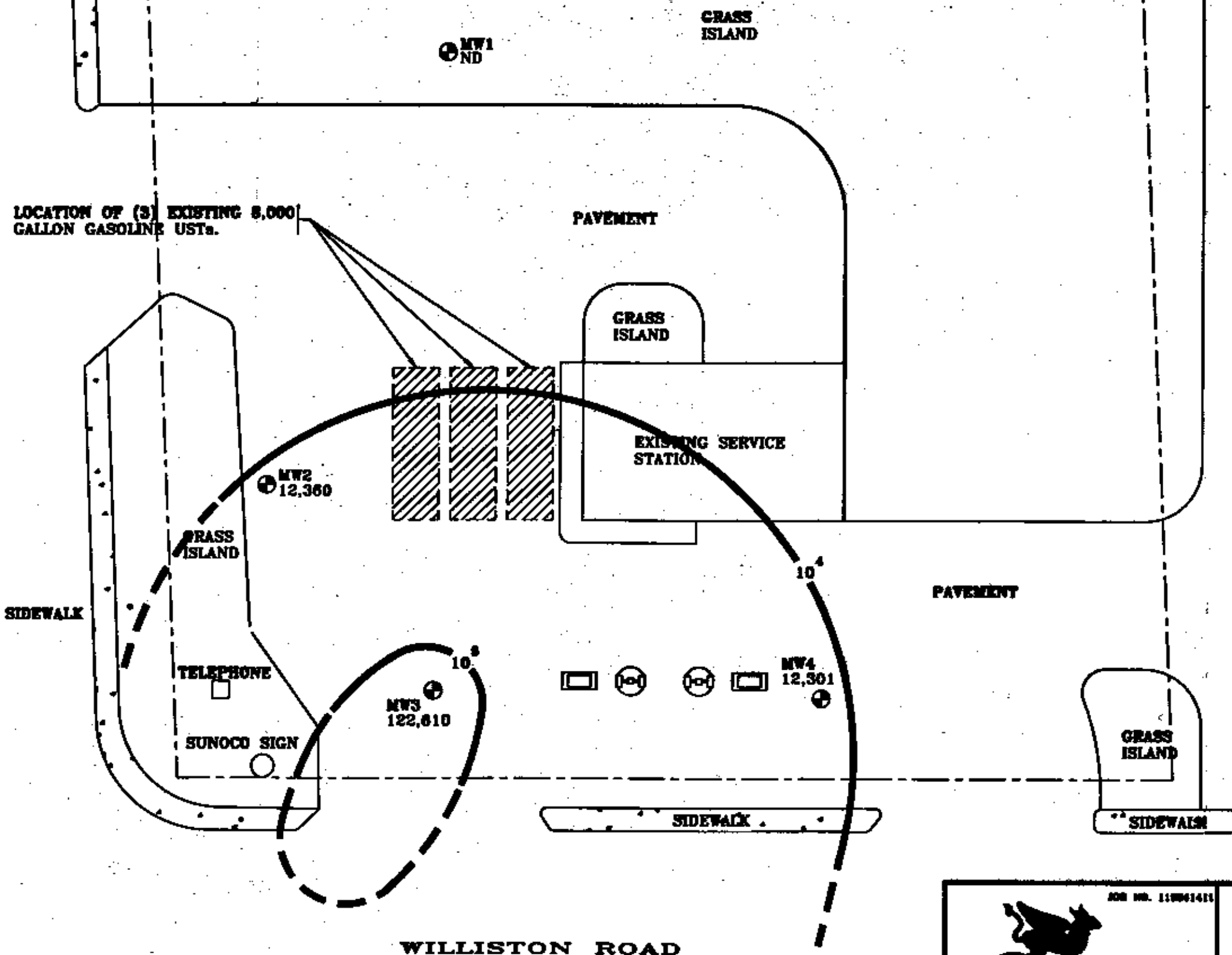
SOUTH BURLINGTON, VERMONT

GROUNDWATER CONTOUR MAP  
MEASUREMENT DATE: 1/21/99





DATE: 1/26/99 DVC-J: 2 SCALE: 1"=20' DRW: EMB APP: CW

NOTE: SITE MAP PROVIDED BY SANDRI, MONITORING WELLS SURVEYED BY GRIFFIN INTERNATIONAL, INC.

MARY STREET



# LEGEND

-  **MW2 12,360** MONITORING WELL AND TOTAL TARGETED VOCs (PPB)
-   $10^4$  ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)
- ND** NONE DETECTED
-  PROPERTY BOUNDARY
-  PUMP ISLAND

NOTE: SITE MAP PROVIDED BY SANDRI. MONITORING WELLS SURVEYED BY GRIFFIN INTERNATIONAL, INC.



JOB NO. 110061411

CHAMPLAIN VALLEY SUNOCO

SOUTH BURLINGTON, VERMONT

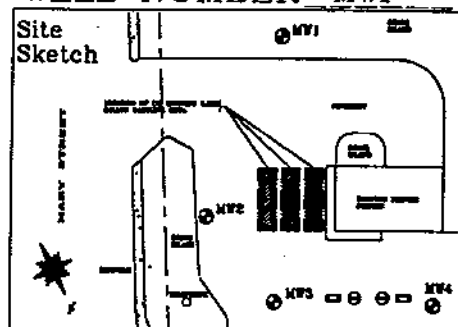
CONTAMINANT DISTRIBUTION MAP  
SAMPLE DATE: 1/21/99

DATE: 1/25/99 DWG. #: 4 SCALE: 1"=20' DRN.: SJB APP.: CW



## **APPENDIX B**

### **Soil Logs and Monitoring Well Specifications**

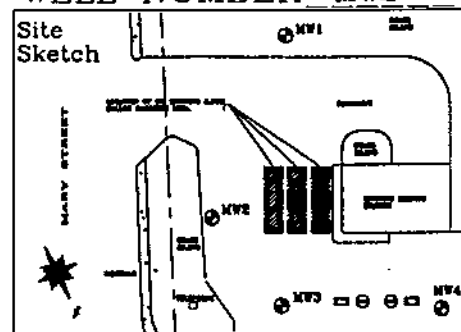
PROJECT CHAMPLAIN VALLEY SUNOCOLOCATION SOUTH BURLINGTON, VERMONTDATE DRILLED 1/12/99 TOTAL DEPTH OF HOLE 17.0'DIAMETER 4.25"SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"CASING DIA. 2" LENGTH 4.5' TYPE sch 40 pvcDRILLING CO. T&K DRILLING METHOD HSADRILLER ALAN TOMMILA LOG BY C. WARDWELL NUMBER MW1

GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0	ROAD BOX	LOCKING WELL CAP			0
1	CONCRETE		0'-2' 0 ppm	SILTY SAND (ML)- 50% silt, nonplastic, no dry strength, fines; 50% fine sand, dry, light brown.	1
2	NATIVE BACKFILL				2
3	BENTONITE				3
4	WELL RISER				4
5			5'-7'- 5/12/15/21 0 ppm	SILTY SAND (ML)- 50% silt, nonplastic, no dry strength, fines; 50% fine sand, dry, light brown.	5
6					6
7					7
8					8
9	SAND PACK				9
10				10.0' WATER TABLE	10
11	WELL SCREEN		10'-12'- 3/3/4/6 0 ppm	SILTY LEAN CLAY (CL)- 100% slow dilatancy, low toughness, low plasticity, medium dry strength, very soft consistency, fines; wet, gray/brown.	11
12					12
13					13
14	BOTTOM CAP				14
15			15'-17'- 2/2/2/4 0 ppm	SILTY LEAN CLAY (CL)- 100% rapid dilatancy, low toughness, medium plasticity, medium dry strength, soft consistency, fines; wet, gray/brown.	15
16					16
17	UNDISTURBED NATIVE SOIL			BASE OF WELL AT 15' END OF EXPLORATION AT 17'	17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT CHAMPLAIN VALLEY SUNOCO  
 LOCATION SOUTH BURLINGTON, VERMONT  
 DATE DRILLED 1/12/99 TOTAL DEPTH OF HOLE 17.0'  
 DIAMETER 4.25"  
 SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"  
 CASING DIA. 2" LENGTH 4.35' TYPE sch 40 pvc  
 DRILLING CO. T&K DRILLING METHOD HSA  
 DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW2



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0	ROAD BOX	LOCKING WELL CAP			0
1	CONCRETE		0'-2'	SANDY SILT (ML)- 50% silt, no dry strength, fines; 50% fine sand, loose, dry, brown.	1
2	NATIVE BACKFILL		0 ppm		2
3	BENTONITE				3
4					4
5	WELL RISER		5'-7'-	SANDY SILT (ML)- 50% silt, no dry strength, fines; 50% fine sand, loose, dry, light brown.	5
6			5/9/9/14		6
7			0 ppm		7
8					8
9	SAND PACK				9
10				10.0' WATER TABLE	10
11	WELL SCREEN		10'-12'-	SILT (ML)- 100% rapid dilatancy, low toughness, medium plasticity, no dry strength, soft consistency, fines; wet, gray/brown, 1mm thick gray clay layers in middle.	11
12			5/3/7/9		12
13			2 ppm		13
14	BOTTOM CAP				14
15			15'-17'-	SILT (ML)- 100% rapid dilatancy, low toughness, medium plasticity, low dry strength, soft consistency, fines; wet, gray/brown.	15
16			2/2/3/4		16
17	UNDISTURBED NATIVE SOIL		0 ppm	BASE OF WELL AT 15' END OF EXPLORATION AT 17'	17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT CHAMPLAIN VALLEY SUNOCO

LOCATION SOUTH BURLINGTON, VERMONT

DATE DRILLED 1/12/99 TOTAL DEPTH OF HOLE 17.0'

DIAMETER 4.25"

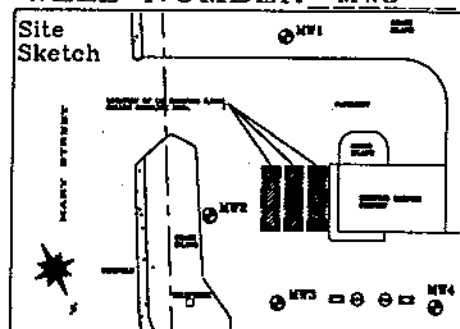
SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 4.5' TYPE sch 40 pvc

DRILLING CO. T&K DRILLING METHOD HSA

DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW3



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
1		LOCKING WELL CAP			1
2		CONCRETE	0'-2' 0.2 ppm	SANDY SILT (ML)- 50% silt, no dry strength, fines; 50% fine sand, loose, dry, light brown.	2
3		NATIVE BACKFILL			3
4		BENTONITE			4
5		WELL RISER	5'-7'- 7/9/17/16 0 ppm	SANDY SILT (ML)- 50% silt, no dry strength, fines; 50% sand, loose, dry, light brown.	5
6				ELASTIC SILT (MH)- 90% slow dilatancy, medium toughness, medium plasticity, low to medium dry strength, soft consistency, fines; 10% sand, moist, orange/brown.	6
7					7
8					8
9		SAND PACK			9
10				10.0' WATER TABLE	10
11		WELL SCREEN	10'-12'- 7/8/6/10 70 ppm	SILT (ML)- 100% rapid dilatancy, low toughness, medium plasticity, low dry strength, fines; wet, gray/brown.	11
12					12
13					13
14		BOTTOM CAP			14
15			15'-17'- 2/2/3/4 1 ppm	LEAN CLAY (CL)- 100% slow dilatancy, medium toughness, high plasticity, high dry strength, very soft consistency, fines; wet, brownish gray.	15
16					16
17		UNDISTURBED NATIVE SOIL		BASE OF WELL AT 15' END OF EXPLORATION AT 17'	17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT CHAMPLAIN VALLEY SUNOCO  
 LOCATION SOUTH BURLINGTON, VERMONT

DATE DRILLED 1/12/99 TOTAL DEPTH OF HOLE 17.0'  
 DIAMETER 4.25"

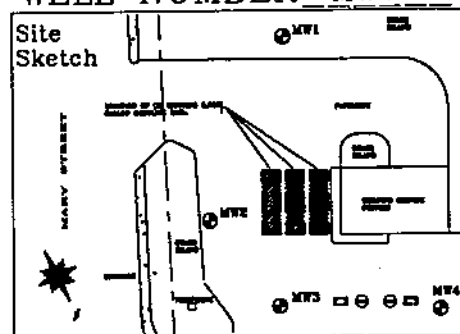
SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 4.3' TYPE sch 40 pvc

DRILLING CO. T&K DRILLING METHOD HSA

DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW4



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
1		LOCKING WELL CAP			1
2		CONCRETE	0'-2' 0.2 ppm	SILTY SAND (ML)- 50% silt, fines; 50% fine sand, loose, dry, light brown.	2
3		NATIVE BACKFILL			3
4		BENTONITE			4
5		WELL RISER	5'-7'- 4/5/7/9 0.2 ppm	SILTY SAND (ML)- 40% silt, fines; 60% fine sand, loose, dry, orange brown.	5
6					6
7					7
8					8
9		SAND PACK			9
10				10.0' WATER TABLE	10
11		WELL SCREEN	10'-12'- 3/4/4/3 4 ppm	SILT (ML)- 100% rapid dilatancy, low toughness, nonplastic, low dry strength, fines; wet, gray/brown.	11
12					12
13					13
14		BOTTOM CAP			14
15			15'-17'- 3/3/4/5 0.2 ppm	LEAN CLAY (CL)- 100% none to slow dilatancy, medium toughness, medium plasticity, high dry strength, fines; wet, gray/brown.	15
16					16
17		UNDISTURBED NATIVE SOIL		BASE OF WELL AT 15' END OF EXPLORATION AT 17'	17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

## **APPENDIX C**

### **Liquid Level Monitoring Data**

# LIQUID LEVEL MONITORING DATA

CHAMPLAIN VALLEY SUNOCO  
1143 WILLISTON ROAD  
SOUTH BURLINGTON, VERMONT

1/21/99

Well I.D.	Well Depth bgs	Top of Casing Elevation	Depth To Product btoc	Depth To Water btoc	Product Thickness	Specific Gravity Of Product	Water Equivalent	Corrected Depth To Water	Corrected Water Table Elevation
MW-1	15	100.00	-	8.65	-	-	-	-	91.35
MW-2	15	99.22	-	8.44	-	-	-	-	90.78
MW-3	15	98.63	-	8.33	-	-	-	-	90.30
MW-4	15	99.02	-	7.92	-	-	-	-	91.10

All Values Reported in Feet

btoc - Below Top of Casing

bgs - Below Ground Surface

Elevations determined relative to top of casing of MW-1, which was arbitrarily set at 100'

Top of Casing Elevations surveyed by Griffin on 1/12/99

## **APPENDIX D**

### **Water Quality Data**



# WATER QUALITY DATA

## CHAMPLAIN VALLEY SUNOCO WILLISTON ROAD SOUTH BURLINGTON, VERMONT

Sample Location Sample Date: Analytical Method:	MW-1 1/21/99 8021B	MW-2 1/21/99 8021B	MW-3 1/21/99 8021B	MW-4 1/21/99 8021B	VGES (ppb)
PARAMETER					
Benzene	ND>1	<b>342.</b>	<b>6,860.</b>	ND>50	5.
Toluene	ND>1	<b>1,900.</b>	<b>26,900.</b>	ND>50	1,000.
Ethylbenzene	ND>1	<b>312.</b>	<b>2,700.</b>	<b>650.</b>	700.
Xylenes	ND>1	<b>4,360.</b>	<b>13,600.</b>	<b>8,020.</b>	10,000.
Total BTEX	ND	<b>6,914.</b>	<b>50,060.</b>	<b>8,670.</b>	-
MTBE	ND>10	<b>3,860.</b>	<b>70,600.</b>	ND>500	40.
1,3,5-Trimethylbenzene	ND>1	<b>345.</b>	<b>TBQ&lt;1,000</b>	<b>726.</b>	4.
1,2,4-Trimethylbenzene	ND>1	<b>950.</b>	<b>1,950.</b>	<b>2,210.</b>	5.
Naphthalene	ND>1	<b>291.</b>	ND>1,000	<b>695.</b>	20.
Total Targeted VOCs	ND	<b>12,360.</b>	<b>122,610.</b>	<b>12,301.</b>	-

All Values Reported in ug/L (ppb)

ND>1 - None Detected above Detection Limit

TBQ<1 - Trace Below Quantitation Limit

Detections are bolded.

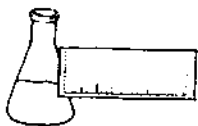
Blank cell - not analyzed

VGES - Vermont Groundwater Enforcement Standard

>VGES

## **APPENDIX E**

### **Analytical Laboratory Report: Groundwater**



**ENDYNE, INC.**

**Laboratory Services**

32 James Brown Drive  
Williston, Vermont 05495  
(802) 879-4333  
FAX 879-7103

**REPORT OF LABORATORY ANALYSIS**

CLIENT: Griffin International

PROJECT CODE: 1127

PROJECT NAME: Champ. Valley Sunoco/1198414 REF.#: 134,090 - 134,095

REPORT DATE: February 2, 1999

DATE SAMPLED: January 21, 1999

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.  
Laboratory Director

enclosures

**ENDYNE, INC.****Laboratory Services**

32 James Brown Drive  
Williston, Vermont 05495  
(802) 879-4333  
FAX 879-7103

**EPA METHOD 8021B--PURGEABLE AROMATICS**

CLIENT: Griffin International

DATE RECEIVED: January 22, 1999

PROJECT NAME: Champ. Valley Sunoco/119841411

REPORT DATE: February 2, 1999

CLIENT PROJ. #: 119841411

PROJECT CODE: 1127

Ref. #:	134,090	134,091	134,092	134,093	134,094
Site:	Trip Blank	MW #3	Duplicate	MW #4	MW #2
Date Sampled:	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99
Time Sampled:	7:50	12:24	12:24	12:35	12:50
Sampler:	D. Tourangeau	D. Tourangeau	D. Tourangeau	D. Tourangeau	D. Tourangeau
Date Analyzed:	1/30/99	2/1/99	2/1/99	2/1/99	2/1/99
UIP Count:	0	4	4	>10	>10
Dil. Factor (%):	100	0.1	0.1	2	2
Surr % Rec. (%):	92	97	95	97	102
Parameter	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)
MTBE	<10	70,600.	67,900.	<500	3,860.
Benzene	<1	6,860.	6,850.	<50	342.
Toluene	<1	26,900.	26,900.	<50	1,900.
Ethylbenzene	<1	2,700.	2,700.	650.	312.
Xylenes	<1	13,600.	13,700.	8,020.	4,360.
1,3,5 Trimethyl Benzene	<1	TBQ <1000	TBQ <1000	726.	345.
1,2,4 Trimethyl Benzene	<1	1,980.	1,950.	2,210.	950.
Naphthalene	<1	<1000	<1000	695.	291.

802015F0156

Ref. #:	134,095				
Site:	MW #1				
Date Sampled:	1/21/99				
Time Sampled:	1:08				
Sampler:	D. Tourangeau				
Date Analyzed:	1/30/99				
UIP Count:	0				
Dil. Factor (%):	100				
Surr % Rec. (%):	97				
Parameter	Conc. (ug/L)				
MTBE	<10				
Benzene	<1				
Toluene	<1				
Ethylbenzene	<1				
Xylenes	<1				
1,3,5 Trimethyl Benzene	<1				
1,2,4 Trimethyl Benzene	<1				
Naphthalene	<1				

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated



## **APPENDIX F**

### **Analytical Laboratory Report: Soil Stockpile**



**SPECTRUM ANALYTICAL, INC.**

Massachusetts Certification M-MA 138  
Connecticut Approval # PH 0777  
Rhode Island # 98 & Maine # n/a  
New Hampshire ID # 2538  
New York ID #11393  
Florida HRS87448

RECEIVED DEC 28 1998

*Griffin International  
P.O. Box 943  
19 Commercial Street  
Williston, VT 05495  
Attn: Chris Wood*

*December 21, 1998*

Client Project No.:

Location: Champlain Valley Sunoco - VT

Lab ID No.

Client ID

Analysis Requested

AB27935

SS#1

EPA Method 8260  
TPH Modified 8015 (soil)  
Flash Point  
Total Arsenic  
Total Barium  
Total Cadmium  
Total Chromium  
Total Lead  
Total Mercury  
Total Selenium  
Total Silver

AB27936

SS#2

EPA Method 8260  
TPH Modified 8015 (soil)  
Flash Point  
Total Arsenic  
Total Barium  
Total Cadmium  
Total Chromium  
Total Lead  
Total Mercury  
Total Selenium  
Total Silver

Authorized by

Hanibal Tayeh

President/Laboratory Director

ENVIRONMENTAL ANALYSES

**SPECTRUM ANALYTICAL, INC.****Laboratory Report**

Client ID: **SS#1**  
Lab ID No.: **AB27935**

Location: **Champlain Valley Sunoco - VT**  
Client Job No.:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
Received on 12/11/98 by MBR  
QC and Data Review by

Preservative: Refrigeration  
Container: 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

**Volatile Organics**

EPA Method 8260

Parameter for AB27935	Result (ug/Kg)	MDL	Extracted	Analyzed	Analyst
Benzene	Not detected	293.4	12/15/98	12/19/98	DG
Bromobenzene	Not detected	293.4	12/15/98	12/19/98	DG
Bromochloromethane	Not detected	293.4	12/15/98	12/19/98	DG
Bromodichloromethane	Not detected	293.4	12/15/98	12/19/98	DG
Bromoform	Not detected	293.4	12/15/98	12/19/98	DG
n-Butylbenzene	3,100	293.4	12/15/98	12/19/98	DG
sec-Butylbenzene	320	293.4	12/15/98	12/19/98	DG
tert-Butylbenzene	Not detected	293.4	12/15/98	12/19/98	DG
Carbon tetrachloride	Not detected	293.4	12/15/98	12/19/98	DG
Chlorobenzene	Not detected	293.4	12/15/98	12/19/98	DG
Chloroform	Not detected	293.4	12/15/98	12/19/98	DG
2-Chlorotoluene	Not detected	293.4	12/15/98	12/19/98	DG
4-Chlorotoluene	Not detected	293.4	12/15/98	12/19/98	DG
1,2-Dibromo-3-chloropropane	Not detected	293.4	12/15/98	12/19/98	DG
Dibromochloromethane	Not detected	293.4	12/15/98	12/19/98	DG
1,2-Dibromoethane (EDB)	Not detected	293.4	12/15/98	12/19/98	DG
Dibromomethane	Not detected	293.4	12/15/98	12/19/98	DG
1,2-Dichlorobenzene	Not detected	293.4	12/15/98	12/19/98	DG
1,3-Dichlorobenzene	Not detected	293.4	12/15/98	12/19/98	DG
1,4-Dichlorobenzene	Not detected	293.4	12/15/98	12/19/98	DG
1,1-Dichloroethane	Not detected	293.4	12/15/98	12/19/98	DG
1,2-Dichloroethane	Not detected	293.4	12/15/98	12/19/98	DG
1,1-Dichloroethene	Not detected	293.4	12/15/98	12/19/98	DG
cis-1,2-Dichloroethene	Not detected	293.4	12/15/98	12/19/98	DG
trans-1,2-Dichloroethene	Not detected	293.4	12/15/98	12/19/98	DG
1,2-Dichloropropane	Not detected	293.4	12/15/98	12/19/98	DG
1,3-Dichloropropane	Not detected	293.4	12/15/98	12/19/98	DG
2,2-Dichloropropane	Not detected	293.4	12/15/98	12/19/98	DG



Parameter for AB27935	Result (ug/Kg)	MDL	Extracted	Analyzed	Analyst
1,1-Dichloropropene	Not detected	293.4	12/15/98	12/19/98	DG
cis-1,3-Dichloropropene	Not detected	293.4	12/15/98	12/19/98	DG
trans-1,3-Dichloropropene	Not detected	293.4	12/15/98	12/19/98	DG
Ethylbenzene	Not detected	293.4	12/15/98	12/19/98	DG
Hexachlorobutadiene	Not detected	293.4	12/15/98	12/19/98	DG
Isopropylbenzene	Not detected	293.4	12/15/98	12/19/98	DG
4-Isopropyltoluene	690	293.4	12/15/98	12/19/98	DG
Methylene chloride	Not detected	293.4	12/15/98	12/19/98	DG
Naphthalene	6,800	293.4	12/15/98	12/19/98	DG
n-Propylbenzene	540	293.4	12/15/98	12/19/98	DG
Styrene	Not detected	293.4	12/15/98	12/19/98	DG
1,1,1,2-Tetrachloroethane	Not detected	293.4	12/15/98	12/19/98	DG
1,1,2,2-Tetrachloroethane	Not detected	293.4	12/15/98	12/19/98	DG
Tetrachloroethene	Not detected	293.4	12/15/98	12/19/98	DG
Toluene	Not detected	293.4	12/15/98	12/19/98	DG
1,2,3-Trichlorobenzene	Not detected	293.4	12/15/98	12/19/98	DG
1,2,4-Trichlorobenzene	Not detected	293.4	12/15/98	12/19/98	DG
1,1,1-Trichloroethane	Not detected	293.4	12/15/98	12/19/98	DG
1,1,2-Trichloroethane	Not detected	293.4	12/15/98	12/19/98	DG
Trichloroethene	Not detected	293.4	12/15/98	12/19/98	DG
Trichlorofluoromethane	Not detected	293.4	12/15/98	12/19/98	DG
1,2,3-Trichloropropane	Not detected	293.4	12/15/98	12/19/98	DG
1,2,4-Trimethylbenzene	21,800	293.4	12/15/98	12/19/98	DG
1,3,5-Trimethylbenzene	8,100	293.4	12/15/98	12/19/98	DG
m,p-Xylenes	6,400	586.8	12/15/98	12/19/98	DG
o-Xylene	4,300	293.4	12/15/98	12/19/98	DG
Methyl t-butyl ether	Not detected	293.4	12/15/98	12/19/98	DG
BFB Surrogate Recovery (%)	107		12/15/98	12/19/98	DG
p-DFB Surrogate Recovery (%)	115		12/15/98	12/19/98	DG
CLB-d <sub>8</sub> Surrogate Recovery (%)	103		12/15/98	12/19/98	DG
% Solids	89.2	0.1	12/16/98	12/16/98	CLD

# SPECTRUM ANALYTICAL, INC.

## Laboratory Report

Client ID: SS#1  
Lab ID No: AB27935

Location: Champlain Valley Sunoco - VT  
Client Job No.:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
Received on 12/11/98 by MBR  
QC and Data Review by

Preservative: Refrigeration  
Container : 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

### Total Petroleum Hydrocarbons by GC

Modified EPA Method 8015

Parameter	Result (mg/Kg)	MDL	Extracted	Analyzed	Analyst
Total Hydrocarbons	21		12/15/98	12/16/98	ATP
<b>Fingerprint based quantification:</b>					
Gasoline	*	20	12/15/98	12/16/98	ATP
Fuel Oil #2	Not detected	20	12/15/98	12/16/98	ATP
Fuel Oil #4	Not detected	20	12/15/98	12/16/98	ATP
Fuel Oil #6	Not detected	40	12/15/98	12/16/98	ATP
Motor Oil	Not detected	40	12/15/98	12/16/98	ATP
Ligroin	Not detected	20	12/15/98	12/16/98	ATP
Aviation Fuel	Not detected	20	12/15/98	12/16/98	ATP
Unidentified	21		12/15/98	12/16/98	ATP
Other Oil	Not detected	40	12/15/98	12/16/98	ATP
% Solids	89.2	0.1	12/16/98	12/16/98	CLD

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from petroleum products. Possible match categories are as follows;

Gasoline - includes regular, unleaded, premium, etc.

Fuel Oil #2 - includes home heating oil, #2 fuel oil and diesel.

Fuel Oil #4 - Includes #4 Fuel Oil

Fuel Oil #6 - includes #6 oil and bunker "C" oil.

Motor Oil - includes virgin and waste automobile oils.

Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha.

Aviation Fuels - includes Kerosene, Jet A and JP-4.

Other Oil - includes cutting and lubricating oils.

Factors such as microbial degradation, weathering and solubility generally prevent specific identification within a petroleum category. A finding of "unidentified" means that the sample fingerprint was characteristic of a petroleum product, but could not be matched to a fingerprint in the library.

After fingerprint identification, the amount present in the sample is quantified using a calibration curve prepared from a petroleum product of the same category as the identified petroleum. Unidentified petroleum is quantified using a petroleum calibration that approximates the distribution of compounds in the sample.

A \* in the results column indicates the petroleum calibration used to quantify unidentified samples.

# SPECTRUM ANALYTICAL, INC.

## Laboratory Report

Client ID: SS#1  
Lab ID No: AB27935

Location: Champlain Valley Sunoco - VT  
Client Job No:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
Received on 12/11/98 by MBR  
QC and Data Review by

Preservative: Refrigeration  
Container: 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

### Total RCRA8 Metals

EPA Methods 200.7 & 245.1

Parameter	Result (mg/Kg)	MDL	Extracted	Analyzed	Analyst
Total Arsenic	nd	0.928	12/15/98	12/18/98	DMM
Total Barium	16.0	0.928	12/15/98	12/18/98	DMM
Total Cadmium	nd	0.928	12/15/98	12/18/98	DMM
Total Chromium	9.83	0.928	12/15/98	12/18/98	DMM
Total Lead	7.14	0.464	12/15/98	12/18/98	DMM
Total Selenium	nd	0.928	12/15/98	12/18/98	DMM
Total Silver	nd	1.86	12/15/98	12/18/98	DMM
Total Mercury	nd	0.192	12/15/98	12/21/98	JM

# SPECTRUM ANALYTICAL, INC.

## Laboratory Report

Client ID: SS#1  
Lab ID No.: AB27935

Location: Champlain Valley Sunoco - VT  
Client Job No.:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
Received on 12/11/98 by MBR  
QC and Data Review by

Preservative: Refrigeration  
Container: 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

### Flash Point

SW846 1010

Parameter	Result (degree F)	Analyzed	Analyst
Flash Point	>200	12/16/98	DMM

**SPECTRUM ANALYTICAL, INC.****Laboratory Report**

Client ID: **SS#2**  
Lab ID No.: **AB27936**

Location: **Champlain Valley Sunoco - VT**  
Client Job No.:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
Received on 12/11/98 by MBR  
QC and Data Review by

Preservative: Refrigeration  
Container: 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

**Volatile Organics**

EPA Method 8260

Parameter for AB27936	Result (ug/Kg)	MDL	Extracted	Analyzed	Analyst
Benzene	Not detected	28.0	12/15/98	12/19/98	DG
Bromobenzene	Not detected	28.0	12/15/98	12/19/98	DG
Bromochloromethane	Not detected	28.0	12/15/98	12/19/98	DG
Bromodichloromethane	Not detected	28.0	12/15/98	12/19/98	DG
Bromoform	Not detected	28.0	12/15/98	12/19/98	DG
n-Butylbenzene	Not detected	28.0	12/15/98	12/19/98	DG
sec-Butylbenzene	Not detected	28.0	12/15/98	12/19/98	DG
tert-Butylbenzene	Not detected	28.0	12/15/98	12/19/98	DG
Carbon tetrachloride	Not detected	28.0	12/15/98	12/19/98	DG
Chlorobenzene	Not detected	28.0	12/15/98	12/19/98	DG
Chloroform	Not detected	28.0	12/15/98	12/19/98	DG
2-Chlorotoluene	Not detected	28.0	12/15/98	12/19/98	DG
4-Chlorotoluene	Not detected	28.0	12/15/98	12/19/98	DG
1,2-Dibromo-3-chloropropane	Not detected	28.0	12/15/98	12/19/98	DG
Dibromochloromethane	Not detected	28.0	12/15/98	12/19/98	DG
1,2-Dibromoethane (EDB)	Not detected	28.0	12/15/98	12/19/98	DG
Dibromomethane	Not detected	28.0	12/15/98	12/19/98	DG
1,2-Dichlorobenzene	Not detected	28.0	12/15/98	12/19/98	DG
1,3-Dichlorobenzene	Not detected	28.0	12/15/98	12/19/98	DG
1,4-Dichlorobenzene	Not detected	28.0	12/15/98	12/19/98	DG
1,1-Dichloroethane	Not detected	28.0	12/15/98	12/19/98	DG
1,2-Dichloroethane	Not detected	28.0	12/15/98	12/19/98	DG
1,1-Dichloroethene	Not detected	28.0	12/15/98	12/19/98	DG
cis-1,2-Dichloroethene	Not detected	28.0	12/15/98	12/19/98	DG
trans-1,2-Dichloroethene	Not detected	28.0	12/15/98	12/19/98	DG
1,2-Dichloropropane	Not detected	28.0	12/15/98	12/19/98	DG
1,3-Dichloropropane	Not detected	28.0	12/15/98	12/19/98	DG
2,2-Dichloropropane	Not detected	28.0	12/15/98	12/19/98	DG

Parameter for AB27936	Result (ug/Kg)	MDL	Extracted	Analyzed	Analyst	
1,1-Dichloropropene	Not detected	28.0	12/15/98	12/19/98	DG	—
cis-1,3-Dichloropropene	Not detected	28.0	12/15/98	12/19/98	DG	—
trans-1,3-Dichloropropene	Not detected	28.0	12/15/98	12/19/98	DG	—
Ethylbenzene	Not detected	28.0	12/15/98	12/19/98	DG	—
Hexachlorobutadiene	Not detected	28.0	12/15/98	12/19/98	DG	—
Isopropylbenzene	Not detected	28.0	12/15/98	12/19/98	DG	—
4-Isopropyltoluene	Not detected	28.0	12/15/98	12/19/98	DG	—
Methylene chloride	Not detected	28.0	12/15/98	12/19/98	DG	—
Naphthalene	Not detected	100.0	12/15/98	12/19/98	DG	—
n-Propylbenzene	Not detected	28.0	12/15/98	12/19/98	DG	—
Styrene	Not detected	28.0	12/15/98	12/19/98	DG	—
1,1,1,2-Tetrachloroethane	Not detected	28.0	12/15/98	12/19/98	DG	—
1,1,2,2-Tetrachloroethane	Not detected	28.0	12/15/98	12/19/98	DG	—
Tetrachloroethene	Not detected	28.0	12/15/98	12/19/98	DG	—
Toluene	Not detected	28.0	12/15/98	12/19/98	DG	—
1,2,3-Trichlorobenzene	Not detected	28.0	12/15/98	12/19/98	DG	—
1,2,4-Trichlorobenzene	Not detected	50.0	12/15/98	12/19/98	DG	—
1,1,1-Trichloroethane	Not detected	28.0	12/15/98	12/19/98	DG	—
1,1,2-Trichloroethane	Not detected	28.0	12/15/98	12/19/98	DG	—
Trichloroethene	Not detected	28.0	12/15/98	12/19/98	DG	—
Trichlorofluoromethane	Not detected	28.0	12/15/98	12/19/98	DG	—
1,2,3-Trichloropropane	Not detected	28.0	12/15/98	12/19/98	DG	—
1,2,4-Trimethylbenzene	Not detected	28.0	12/15/98	12/19/98	DG	—
1,3,5-Trimethylbenzene	Not detected	28.0	12/15/98	12/19/98	DG	—
m,p-Xylenes	Not detected	56.0	12/15/98	12/19/98	DG	—
o-Xylene	Not detected	28.0	12/15/98	12/19/98	DG	—
Methyl-t-butyl ether	Not detected	28.0	12/15/98	12/19/98	DG	—
BFB Surrogate Recovery (%)	104		12/15/98	12/19/98	DG	—
p-DFB Surrogate Recovery (%)	99		12/15/98	12/19/98	DG	—
CLB-d5 Surrogate Recovery (%)	104		12/15/98	12/19/98	DG	—
% Solids	93.3	0.1	12/15/98	12/15/98	SC	—

# SPECTRUM ANALYTICAL, INC.

## Laboratory Report

Client ID: SS#2  
Lab ID No: AB27936

Location: Champlain Valley Sunoco - VT  
Client Job No.:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
Received on 12/11/98 by MBR  
QC and Data Review by

Preservative: Refrigeration  
Container : 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

### Total Petroleum Hydrocarbons by GC

Modified EPA Method 8015

Parameter	Result (mg/Kg)	MDL	Extracted	Analyzed	Analyst
Total Hydrocarbons	Not detected		12/15/98	12/16/98	ATP
<b>Fingerprint based quantification:</b>					
Gasoline	Not detected	20	12/15/98	12/16/98	ATP
Fuel Oil #2	Not detected	20	12/15/98	12/16/98	ATP
Fuel Oil #4	Not detected	20	12/15/98	12/16/98	ATP
Fuel Oil #6	Not detected	40	12/15/98	12/16/98	ATP
Motor Oil	Not detected	40	12/15/98	12/16/98	ATP
Ligroin	Not detected	20	12/15/98	12/16/98	ATP
Aviation Fuel	Not detected	20	12/15/98	12/16/98	ATP
Unidentified	Not detected		12/15/98	12/16/98	ATP
Other Oil	Not detected	40	12/15/98	12/16/98	ATP
% Solids	93.3	0.1	12/15/98	12/15/98	SC

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from petroleum products. Possible match categories are as follows;

Gasoline - includes regular, unleaded, premium, etc.

Fuel Oil #2 - includes home heating oil, #2 fuel oil and diesel.

Fuel Oil #4 - Includes #4 Fuel Oil

Fuel Oil #6 - includes #6 oil and bunker "C" oil.

Motor Oil - includes virgin and waste automobile oils.

Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha.

Aviation Fuels - includes Kerosene, Jet A and JP-4.

Other Oil - includes cutting and lubricating oils.

Factors such as microbial degradation, weathering and solubility generally prevent specific identification within a petroleum category. A finding of "unidentified" means that the sample fingerprint was characteristic of a petroleum product, but could not be matched to a fingerprint in the library.

After fingerprint identification, the amount present in the sample is quantified using a calibration curve prepared from a petroleum product of the same category as the identified petroleum. Unidentified petroleum is quantified using a petroleum calibration that approximates the distribution of compounds in the sample.

A \* in the results column indicates the petroleum calibration used to quantify unidentified samples.

# SPECTRUM ANALYTICAL, INC.

## Laboratory Report

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Lab ID No: **AB27936**

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Client Job No:

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Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

### Total RCRA8 Metals

EPA Methods 200.7 & 245.1

Parameter	Result (mg/Kg)	MDL	Extracted	Analyzed	Analyst
Total Arsenic	nd	0.887	12/15/98	12/18/98	DMM
Total Barium	11.1	0.887	12/15/98	12/18/98	DMM
Total Cadmium	nd	0.887	12/15/98	12/18/98	DMM
Total Chromium	8.42	0.887	12/15/98	12/18/98	DMM
Total Lead	6.21	0.443	12/15/98	12/18/98	DMM
Total Selenium	nd	0.887	12/15/98	12/18/98	DMM
Total Silver	nd	1.77	12/15/98	12/18/98	DMM
Total Mercury	nd	0.193	12/15/98	12/21/98	JM



# SPECTRUM ANALYTICAL, INC.

## Laboratory Report

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Lab ID No.: **AB27936**

Location: **Champlain Valley Sunoco - VT**  
Client Job No.:

Matrix: Soil  
Collected: 12/10/98 by GRIFFIN  
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Preservative: Refrigeration  
Container: 1 Glass Soil Jar  
Condition of Sample as Received: Satisfactory  
Delivered by: Federal Express

### Flash Point

SW846 1010

#### Parameter

Flash Point

#### Result (degree F)

>200

#### Analyzed

12/16/98

#### Analyst

DMM

# Spectrum Analytical, Inc.

## Laboratory Report Supplement

### References

- Methods for the Determination of Organic Compounds in Drinking Water. EPA-600/4-88/039. EMSL 1988.
- Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020. EMSL 1983.
- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EMSL 1982.
- Test Methods for Evaluating Solid Waste. Physical/Chemical Methods. EPA SW-846. 1986.
- Standard Methods for the Examination of Water and Wastes. APHA-AWWA-WPCF. 16th Edition. 1985.
- Standard Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography. ASTM D 3328. 1982.
- Oil Spill Identification System. U.S. Coast Guard CG-D-52-77. 1977.
- Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA 600/4-79-019. EMSL 1979.
- Choosing Cost-Effective QA/QC (Quality Assurance/Quality Control) Programs for Chemical Analyses. EPA 600/4-85/056. EMSL 1985.

### Report Notations

Not Detected,	=	<i>The compound was not detected at a concentration equal to or above the established method detection limit.</i>	
Not Det, ND or nd			
NC	=	<i>Not Calculated</i>	
MCL	=	<i>EPA Maximum Contamination Level</i>	
VOA	=	<i>Volatile Organic Analysis</i>	
BFB	=	<i>4-Bromofluorobenzene</i>	<i>(An EPA 624 Surrogate)</i>
p-DFB	=	<i>1,4-Difluorobenzene</i>	<i>(An EPA 624 Surrogate)</i>
CLB-d5	=	<i>Chlorobenzene-d5</i>	<i>(An EPA 624 Surrogate)</i>
BCP	=	<i>2-Bromo-1-chloropropane</i>	<i>(An EPA 601 Surrogate)</i>
TFT	=	<i>a,a,a-Trifluorotoluene</i>	<i>(An EPA 602 Surrogate)</i>
Decachlorobiphenyl	=	<i>(an EPA 608/8080 Surrogate)</i>	

### Definitions

**Surrogate Recovery** = The recovery (expressed as a percent) of a non-method analyte (see surrogates listed above) added to the sample for the purpose of monitoring system performance.

**Matrix Spike Recovery** = The recovery (expressed as a percent) of method analytes added to the sample for the purpose of determining any effect of sample composition on analyte recovery.

**Laboratory Replicate** = Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of laboratory duplicates give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

**Field Duplicate** = Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analysis of Field duplicates give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.

**Relative Percent Difference (% RPD)** = The precision measurement obtained on duplicate/replicate analyses. %RPD is calculated as:

$$\%RPD = \frac{(\text{value1} - \text{value2})}{\text{ave. value}} * 100\%$$

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